and grade IV (ventilation inadequate with no $P_{\text{e}CO_2}$ measurement and no perceptible chest wall movement during attempts at positive pressure ventilation) in one patient (0.5%) (grades I and II, and grades III and IV being equivalent to scores <3 and 3 or more, respectively, used by Roberts and colleagues). Thus, of those 188 patients with predicted difficult BMV, barely 7% actually demonstrated difficult BMV. This is less than half the incidence reported by Roberts and colleagues. It is conceivable that the higher incidence in the latter report was caused by the absence of muscle relaxation at the time of assessment of BMV.

In patients with <3 risk factors, the quality of BMV was assessed before administration of a neuromuscular blocking agent. After the administration of succinylcholine in 90 patients with BMV difficulty grade III, the quality of BMV improved by one grade in 56 (62%), and did not worsen in any of the remaining 34 patients. After administration of a non-depolarizing neuromuscular blocking agent in 12 003 patients with BMV difficulty grade I and II, the quality of BMV did not worsen in a single patient. These findings confirm previous ones showing that in patients with unimpaired or with a mix of unimpaired and moderately difficult BMV, the quality of BMV either remained unchanged or improved after the administration of a neuromuscular blocking agent, but never worsened.

During the past 25 yr, in the absence of indication for awake fibreoptic tracheal intubation, I have routinely administered the planned full dose of the neuromuscular blocking agent as soon as the patient went off to sleep. With this practice, I have rarely encountered impossible BMV. In my view, lack of administration of muscle relaxation immediately after induction of anaesthesia should be considered a predictor of difficult BMV. I fully agree with the authors' statement that BMV is 'a vital, life-saving skill for anaesthetists' (although with the advent of supraglottic airway devices, the importance of BMV has somewhat diminished). However, BMV may iatrogenically be made difficult by the reluctance of early muscle relaxation.

The authors of the 4th National Audit Project (NAP4) of the Royal College of Anaesthetists and The Difficult Airway Society make this point a couple of times in the context of difficult ventilation.

### Declaration of interest

None declared.

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5 http://www.rcoa.ac.uk/nap4 (accessed 2 October 2013)

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### Are the obese difficult to intubate?

Editor—Evidence is conflicting about whether increasing BMI is a risk factor for difficult intubation. The objective of this study was to apply the commonly accepted definitions of difficult intubation to morbidly obese patients and determine whether increasing BMI was associated with increasing difficulty. For the purpose of the study, patients were divided into two groups—obese (BMI = 30–45 kg m<sup>−2</sup>) and super-obese (BMI ≥ 45 kg m<sup>−2</sup>). To the best of our knowledge, this is the first study to compare obese and super-obese patients for the incidence of difficult intubation.

Morbidly obese patients undergoing bariatric surgery at our institute were included in this prospective observational study. The chief bariatric anaesthetist was the operator for all intubations. All patients were in the ramped position and paralysed with standard dose of succinylcholine before intubation. An independent observer evaluated the intubation as per the commonly accepted definitions of difficult intubation. The $\chi^2$ test was used to compare intubation difficulty scale (IDS) score ≥ 5 and Cormack grades 3 and 4 between the groups. The Mann–Whitney U-test was used to compare time for intubation and incidence of three or more attempts at intubation between the groups.

A total of 147 patients were studied (Table 1). Between the obese and super-obese groups, there was no significant difference in the incidence of IDS ≥ 5 ($P$-value 0.88). However, there was a significant increase in the incidence of Cormack grades 3 and 4 in the super-obese group. Between the groups, there was no significant difference in time for intubation and incidence of three or more attempts.

Our results indicate that increasing BMI is not associated with increasing intubation difficulty as defined by IDS, time for intubation, and incidence of three or more intubation attempts. There was however an increased incidence of Cormack grades 3 and 4 in the super-obese group. This paradoxical result may be explained by the fact that there exists a lot of confusion over the Cormack grade 3 laryngoscopic view. Studies have shown that the reproducibility of this grading system is limited and that Cormack grade used as a definition for difficult intubation may overestimate the incidence compared with other definitions.1 2

Neligan and colleagues<sup>3</sup> studied morbidly obese patients posted for bariatric surgery and found there was no relationship between difficult intubation (as defined by three or more attempts at intubation) and BMI. They reported a 3.3% incidence of difficult intubation. If we used the same definition of
difficult intubation, our results are similar (3.2% in the obese group and 1.9% in the super-obese group). Thus, the incidence of difficult intubation varies widely with the definition used. Until a standard definition can be accepted, all studies on this controversial issue may give conflicting evidence.

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A convenient alternative for monitoring opening pressure during multiple needle redirection

Editor—Triple monitoring (ultrasound, nerve stimulator, and injection pressure) during nerve block has been proposed as the standard to minimize nerve injury.¹ Ultrasound improves safety in nerve block, but it is relatively user-dependent and hard to differentiate between intra- or extra-fascicular injection by current resolution. Besides, the expert opinion did not reveal that high-definition ultrasound alone could be the answer for safe paraneural injection in popliteal sciatic nerve block in the future.² On the contrary, ultrasound guidance seems to encourage multiple injection and small readjustment of needle tip position has been suggested to ensure local anaesthetic spread to all trunks for supraclavicular block.³ The effect of nerve stimulator might also be attenuated by previous local anaesthetic spread nearby. Therefore, once the needle has been redirected, monitoring ‘every’ opening pressure before local anaesthetic administration is the key to avoid intrafascicular injection, especially during performance of block within the nerve plexus or when the information about needle–nerve contact could not be confirmed. Half-the-air technique helps to keep injection pressure below 15 psi,⁴ from which we provide an easy, convenient, and

| Table 1 Patient characteristics. IDS, intubation difficulty scale |
|----------------------|----------------------|----------------------|----------------------|----------------------|
| Patient characteristics | Total sample (n=147) | Obese group (n=93) | Super-obese group (n=54) | P-value |
| Age (yr) | 38.9 (13.0) | 37.7 (13.1) | 41.0 (12.5) | 0.96 |
| Sex (M/F) | 66/81 | 41/52 | 25/29 | 0.80 |
| Height (cm) | 162.5 (9.4) | 163.1 (9.3) | 161.4 (9.4) | 0.74 |
| Weight (kg) | 115.5 (22.8) | 104.8 (15.2) | 134.1 (21.9) | <0.01 |
| BMI (kg m⁻²) | 43.7 (7.4) | 39.3 (3.8) | 51.2 (5.7) | <0.01 |
| Incidence of IDS>5 (%) | 19.7 | 19.4 | 25.6 | 0.88 |
| Incidence of Cormack grades 3 and 4 (%) | 29.3 | 20.4 | 44.4 | <0.01 |
| Mean time for intubation (min) | 1.39 | 1.35 | 1.47 | 0.19 |
| Incidence of three or more attempts at intubation (%) | 2.7 | 3.2 | 1.9 | 0.51 |

Fig 1 (A) Half-the-air technique through the three-way stopcock. Ten millilitres of air are aspirated into the syringe above 10 ml test volume (D5W or normal saline). Before local anaesthetic injection for a new tip location, the air is compressed to 50% of the original volume and observed to see if the level starts to decrease in the test syringe. The volume spread could also be visualized in the ultrasound image. The white arrow denotes the action of compression. (B) Local anaesthetic injection after the opening pressure test. If the needle tip location passes the opening pressure test, counterclockwise rotate the handle by 90° for connecting the local anaesthetic syringe with the patient. Keep the same needle tip location and then start injecting local anaesthetic into the space already hydrolocated by the test volume (D5W or normal saline). T, test syringe; L, local anaesthetic syringe.